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United States Department of Agriculture
Forest Service

United States Department of Interior
Bureau of Land Management

Accident Investigation Report

Firefighter Entrapment, Burnover and Fatality
Devils Den Incident
Fishlake National Forest, Fillmore Ranger District
USDA Forest Service Intermountain Region
Oak City, Utah

August 17, 2006

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Accident Investigation

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Accident Investigation

Report

Accident: Entrapment, Burnover, and Fatality of firefighter Spencer Stanley Koyle

Location: Fishlake National Forest, Fillmore Ranger District, Utah

Date: August 17, 2006

Investigation team co-leaders:
Joel Holtrop, Deputy Chief, USDA Forest Service, Washington DC
Gust Panos, Deputy State Director, Bureau of Land Management, Alaska State Office, Anchorage, AK

_____ _____
Signature Date

_____ _____
Signature Date

Investigation chief investigator:
Jan Peterson, BLM Idaho State Office, Safety and Health Manager

Investigation team members:
G. Sam Foster, Co-lead trainee, USDA Forest Service, Washington Office
Jeanette Early, Safety Advisor, Cibola NF
Travis Book, Law Enforcement, Dixie NF
Joe Duran, Union Representative, Los Padres NF
Ed Nesselroad, Public Affairs, USDA FS Northern Region
Kurt La Rue, Fire Operations, National Interagency Fire Center
Dan Kleinman, Operations Section Chief, National Incident Management Organization
Dave Davis, Fire Behavior Analyst, BLM Battle Mountain District, Nevada
Marie Bates, Scribe, National Interagency Fire Center
Cherie Ausgotharp, Documentation, BLM Utah State Office

FACTUAL REPORT

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EXECUTIVE SUMMARY

The Devils Den incident occurred in the Eastern Great Basin of Utah, where both long-term and short-term weather and fuels trends contributed to volatile fire conditions.

Fire management in the area is conducted on an interagency basis. Firefighters are members of a close, interagency working and living community.

The fire was first reported late on the evening of August 15, 2006. Burning at an elevation of approximately 7,500 feet in pinyon-juniper, sagebrush, and grass fuels along a steep slope, the fire grew to more than 20 acres by the following morning. On August 16, 2006, ground and air resources made initial attack. By the end of the day the fire had grown to 90 acres and was nearly 75 percent contained.

During the morning hours of August 17, 2006, resources gathered at the helibase below the fire. Aircraft shuttle of firefighters began about 1045 hours. The final lift, containing the incident commander (ICT4), incident commander trainee (ICT4-T), and the assistant fire management officer (AFMO), landed about 1230 hours. Fire activity started to heat up about 1100 hours and began to spot about 1300 hours. By this time, the ICT4 and ICT4-T were present at the rim and the AFMO walked down into the canyon to scout the fire. After working his way down the canyon, the AFMO asked for helitack support and directed water bucket drops on hot spots. The AFMO received reports of additional fire activity above and below his location.

Sometime near 1350 hours, black smoke came out of the drainage. A crew superintendent overheard the ICT4 tell the AFMO to get out of the canyon. Moments later the ICT4 told the AFMO to drop his pack and run.

Evidence indicates that the AFMO began running to escape the fire, dropped his tool, continued running, dropped his pack, and attempted to deploy his fire shelter. Sometime during the entrapment, he was burned over. The fire shelter's design capacity was exceeded by intense heat and direct flame contact and was unable to protect the AFMO.

After an extended search, the body was located at approximately 1700 hours. The fatality was confirmed to the district ranger at approximately 1735 hours, and all forces were off the hill by 2032 hours.

An interagency serious accident investigation team was called and began arriving on-scene August 18, 2006. Over the course of a week, the team compiled statements, interviews, photographs, and evidence from the site consistent with the USDA Forest Service 2005 Accident Investigation Guide. This information was synthesized into human, environmental, and material findings that provided the basis for identifying the following causal and contributing factors:

Causal Factors

1. The AFMO ignored the ICT4 and ICT4-T's assessment to stay out of the canyon.
2. The AFMO lost awareness of blowup potential – Red Flag Warning, fuel, and slope trigger points.
3. The AFMO lost situational awareness while focused on direct action (coordinating bucket drops and securing spots).
4. The AFMO compromised three of the Ten Standard Fire Fighting Orders, eight of the 18 Watch Out Situations, and two components of LCES during his recon mission of the Devils Den wildland fire incident.

Contributing Factors

5. Late arrival of the AFMO on-scene delayed the opportunity to recon the fire at less risk, earlier in the burning period.
6. Keeping track of differences between Forest Service and Bureau of Land Management standards for fire operations may divert attention from safe fire suppression.
7. The AFMO's broader role as acting zone duty officer – encompassing not only the current incident but also evaluating the zone's situation for fire conditions, potential fires, and other considerations – may have affected his situational awareness.

As a result of these factors, the AFMO had little or no choice of an adequate escape route or safety zone at the time of the fire. His location in the chimney; in heavy fuels; in steep, rocky terrain; above the main body of the fire; at 1350 hours in the afternoon; on a southwest aspect; in mid-August; and in southwest Utah where extreme fire behavior had been exhibited and observed for the last five plus weeks all aligned to drive the high intensity/short duration event that claimed the AFMO's life.

NARRATIVE

The Devils Den incident occurred in the Eastern Great Basin of Utah, where protracted drought conditions have prevailed for the past several years. As a result, seasonal moisture recovery in fuels has been limited. High temperatures, low relative humidities, low fuel moistures, and high energy release components prior to the lightning-caused fire all contributed to volatile fire conditions.

Fire management in the area is conducted on an interagency basis. Operations involve personnel from federal, state, and local wildland firefighting organizations. Agencies share personnel seamlessly, with training and qualifications certified by the National Wildfire Coordinating Group. While the firefighters come from different locations, backgrounds, and agencies, they become part of a close figurative and literal community.

The Devils Den fire was first reported on August 15, 2006 at 2356 hours east of Oak City, Utah on the Fillmore Ranger District, Fishlake National Forest. Through the night, efforts were made to pinpoint the fire's location, monitor its spread, and mobilize resources. The fire was burning at an elevation of approximately 7,500 feet in pinyon-juniper (PJ), sagebrush, and grass fuels along a 55-75% slope. Estimated at four acres in size at 0039 hours, the fire grew to an estimated 15-20 acres by 0348 hours when the assistant fire management officer (AFMO) made an initial order for aircraft, crew, and engines.

At 0807 hours on August 16, 2006, the AFMO radioed that he was headed for the fire, designating the incident commander and the helibase location for the day. Resources reported to the base and made initial attack through the day, including retardant drops, water drops, and hand and dozer lining. At 1804 hours the Type 4 incident commander (IC4T) radioed the district ranger (DR) that the fire was approximately 40 acres and that the SSW side of the fire was lined. Around 2015 hours the AFMO radioed the DR that the fire was 90 acres and nearly 75 percent contained. By 2136 hours, all firefighters were off the fire.

Resources began moving to the fire scene early in the morning of August 17, 2006. While some resources were new to the fire, many were responding for the second day of initial attack at Devils Den. Approximately 20 firefighters and fire leadership met at the Fillmore Interagency Fire station and received briefings before heading to the fire. The AFMO, ICT4, and the trainee Type 4 incident commander (ICT4-T) met at the AFMOs office and discussed the current fire situation and suppression plan for August 17. The AFMO then met with the Fillmore DR and reviewed operational issues. At that time it

was agreed that if progress towards containment was not made by 1400 hours they would develop a Wildland Fire Situation Analysis (WFSA) for the incident.

During the morning hours, resources gathered at the helibase below the fire. An early reconnaissance sized the fire up as messy (a mix of burned and unburned fuels), surrounded by retardant from the prior day's air show, and putting-up little smoke. The helitack aircraft shuttled firefighters up to the helispot (H-1) starting about 1045 hours. Helitack personnel reported seeing little smoke on the flight. Over the next two hours the crews received their pre-flight helicopter briefing and were flown into the fire in groups of 3-4. Some forces continued digging line from the previous day and others moved to a safety zone and ate lunch prior to receiving their fire assignments. Crews being flown to H-1 reported they flew directly to the site and saw little or no fire activity. The most common comment was that they were looking at a mop-up shift. Witnesses report the fire began to heat up about 1100 hours.

Between 1215 and1230 hours the final shuttle lifted the ICT4, ICT4-T (who had served as incident commander the previous day) and the AFMO to H-1. The role of the incident commander and trainee was to manage suppression activities at the Devils Den incident. The AFMO, also the zone acting duty officer, had a broader role encompassing not only the current fire situation on the incident but looking ahead to fire management considerations across the zone. En-route, the group conducted an air reconnaissance of the fire and then landed at H-1.

After observing the fire from the head of the canyon, the three discussed tactics for the day. Direct and indirect attack approaches were considered. The ICT4 and ICT4-T expressed concerns about the proposed direct line and the AFMO's plan to walk into the canyon above the one smoke they had seen in the bottom of the drainage on the recon flight. The AFMO, ICT4 and ICT4-T discussed a "Plan B" to paint the ridge tops with retardant and fire out the remaining fuels around the canyon. At that time the ICT4 and ICT4-T strongly urged the AFMO to not recon the canyon. The AFMO replied that he would be OK and left H-1, heading down the southwest facing slope toward the smoke. At 1241 hours the ICT4-T ordered single engine air tankers (SEATs), and Air Attack launched to support the operation.

While the ICT4, ICT4-T and AFMO met at H-1, the crew supervisors were at an overlook near the lunch/safety zone assessing the same smoke. The consensus of the crew supervisors was that cutting direct line downhill toward the smoke was not a viable plan. When the ICT4 and ICT4-T arrived at the rock overlook, the crew supervisors voiced their safety concerns and one of the supervisors told the ICT4 that the crew was not available to support the assignment. The ICT4, ICT4-T and crew supervisors agreed to use Plan B and cut an indirect line, to be fired later, around the top of the canyon. When this information was shared with the AFMO, he agreed to go with the indirect attack plan.

Weather observations were taken at 1300 hours: temperature 82F, relative humidity 19 percent, and winds 5-10 SW. This information was broadcast and heard by a variety of personnel on the fire. It was around this time that an increase in the amount of smoke and a general increase in the fire activity were noted by personnel on the ridge.

After working his way down the canyon, the AFMO initiated direct attack on hotspots when he asked for helitack support and directed water bucket drops. Between 1330 and 1340 hours the ICT4 informed the AFMO that there was now a spot fire above him and that the AFMO was in a tight spot. The AFMO continued to hold his location and to direct the bucket work on the spots below him. At around 1340 hours the helicopter pilot confirmed there was a spot above the AFMO. The helicopter dropped on the upper spot and the AFMO began to move toward it. The helicopter made a second drop on the upper spot, with the AFMO still below it, and returned to the dip to reload. The ICT4 told the AFMO to leave the area. The AFMO replied that he would stay and work the spots.

At around 1345 hours the fire rapidly began to spread uphill. When the helicopter returned, it could no longer effectively support the AFMO because of the turbulence caused by the fire activity and returned to the helibase.

Sometime near 1350 hours, black smoke came out of the drainage. The AFMO began to move up and away from the fire. A crew superintendent overheard the ICT4 tell the AFMO to get out of the canyon. Moments later the ICT4 told the AFMO to drop his pack and run. This request was repeated by both the ICT4 and ICT4-T numerous times.

The canyon was obscured by smoke and vegetation. No witnesses had a clear view of the entrapment. Repeated radio calls to the AFMO went unanswered. A mishap was formally declared at 1406 hours. About 1412 hours, after repeated radio transmissions received no response, all squad bosses were called to H-1, and most firefighters were released to hike down to their vehicles at the helibase. Shortly thereafter, LifeFlight was called for assistance.

Aircraft were enlisted in the search and rescue efforts for the AFMO, without success. Ground parties had to wait more than an hour for the ground to cool sufficiently to allow a safe search. After establishing a grid pattern search, the body was located about 1700 hours. The fatality was confirmed to the district ranger about 1735 hours, and all forces were off the hill by 2032 hours.

An interagency serious accident investigation team was ordered August 17 and began arriving on-scene August 18. A 24-hour report was prepared and submitted on August 18. A 72-hour report was prepared and submitted on August 21. The investigation team conducted site visits, collected statements, and held follow-up interviews through late August and into September. The investigation report was completed and submitted on October 2.

TIMELINE

Constructing an accurate timeline on any incident involves a mixture of sources: dispatch logs, radio transmission voiceprints, individual statements, and individual interviews. Even with access to these primary sources, estimation is sometimes necessary because observations and transmissions are frequently made without a time reference, or source time references may disagree. Times displayed are as accurate as possible. Where it was impossible to develop a specific time, best estimates are provided. Events that can only be placed between established time references are indicated by asterisks.

August 15, 2006

2356 Fire reported high on the mountain above Oak City

August 16, 2006

0039 Fire identified in Devils Den area on steep slopes in grass and PJ
0130 AFMO contacts DR and estimates fire at 4-5 acres (Witness S-43)
0700 ICT4 and firefighting resources begin heading to the fire
1500 AFMO contacts DR and reports air resources hit fire hard
1804 Fire estimated at 40 acres
2015 AFMO contacts DR and estimates size at 90 acres and 75% contained
2136 All resources are off the fire

August 17, 2006

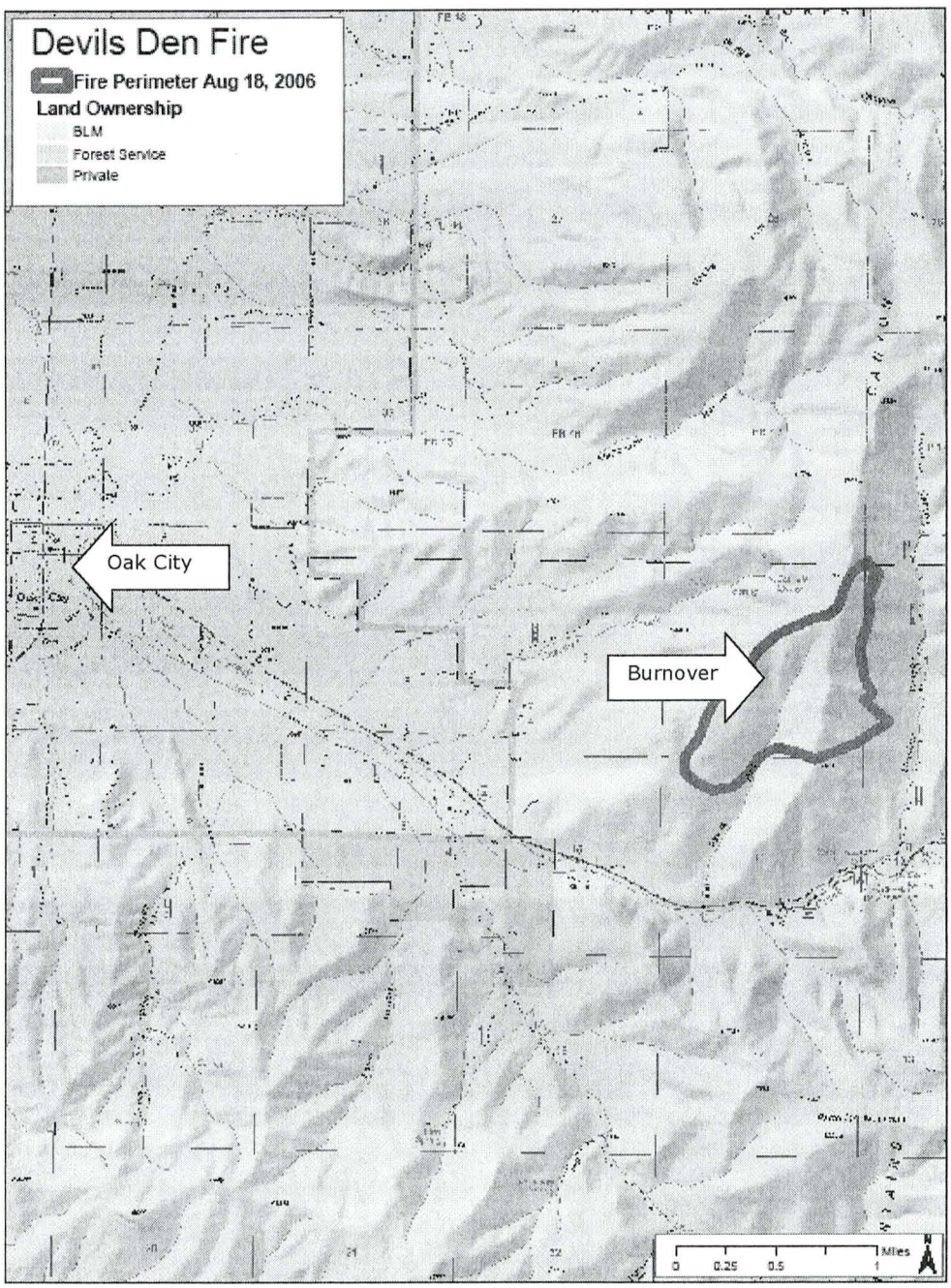
0600 Firefighting resources begin heading to the fire
0945 Overflight sizes-up fire as messy, surrounded by retardant, little smoke
1045 Helitack begins crew shuttle, sees numerous isolated smokes
1100 Fire starts to get active
1215 ICT4, ICT4-T, and AFMO conduct air reconnaissance
* ICT4, ICT4-T, and AFMO arrive at H-1, ending troop shuttle
* ICT4 and ICT4-T tell AFMO it was a bad idea to go into the canyon
* AFMO goes into canyon, saying, "...Oh, I will be fine."
1241 ICT4 calls for SEATS with retardant and air attack
1300 Concern expressed that fire was "about to blow" (Witness S-18)
* AFMO radios concern won't be able to hold fire without retardant
1330 Helitack noticed fire had "blown up"
1330 Trees at bottom starting to torch, fire proceeding to the top (Witness S-24)
* AFMO tells ICT4 to tell people to get to safety zones
* AFMO directing bucket work on spot fires (approximate)
* ICT4 tells AFMO fire spotted above him
1340 Pilot 0RL helps with water drop and radios another spot above AFMO
1345 AFMO calmly radios "I'm in trouble, guys"

*	ICT4 tells AFMO to get out (Witness S-29)
*	ICT4 tells AFMO to drop pack and run (Witness S-29)
*	Pilot 0RL said "She's blown her top"
*	Looked like a tornado going up the canyon, moving fast (Witness S-34)
1347	AFMO again told to drop his pack (Witness S-38)
1350	Huge smoke column forms (Witness S-7)
1353	AFMO overheard breathing hard on radio while trying to reach west ridge (Witness S-38)
1357	Radio calls to AFMO go unanswered (Witness S-38)
1400	ICT4 radios dispatch "in a tight spot...looking for a man"
*	Possible burnover declared; Life Flight called and given coordinates
1406	Mishap declared
1529	ICT4 reports no location of individual, going in to search
1554	New ICT3 assumes command of incident
1700	Body found, "no medivac needed" (Witness S-6)
1735	ICT3 reports body located and fatality confirmed to the district ranger
2032	ICT3 reports all resources off the hill

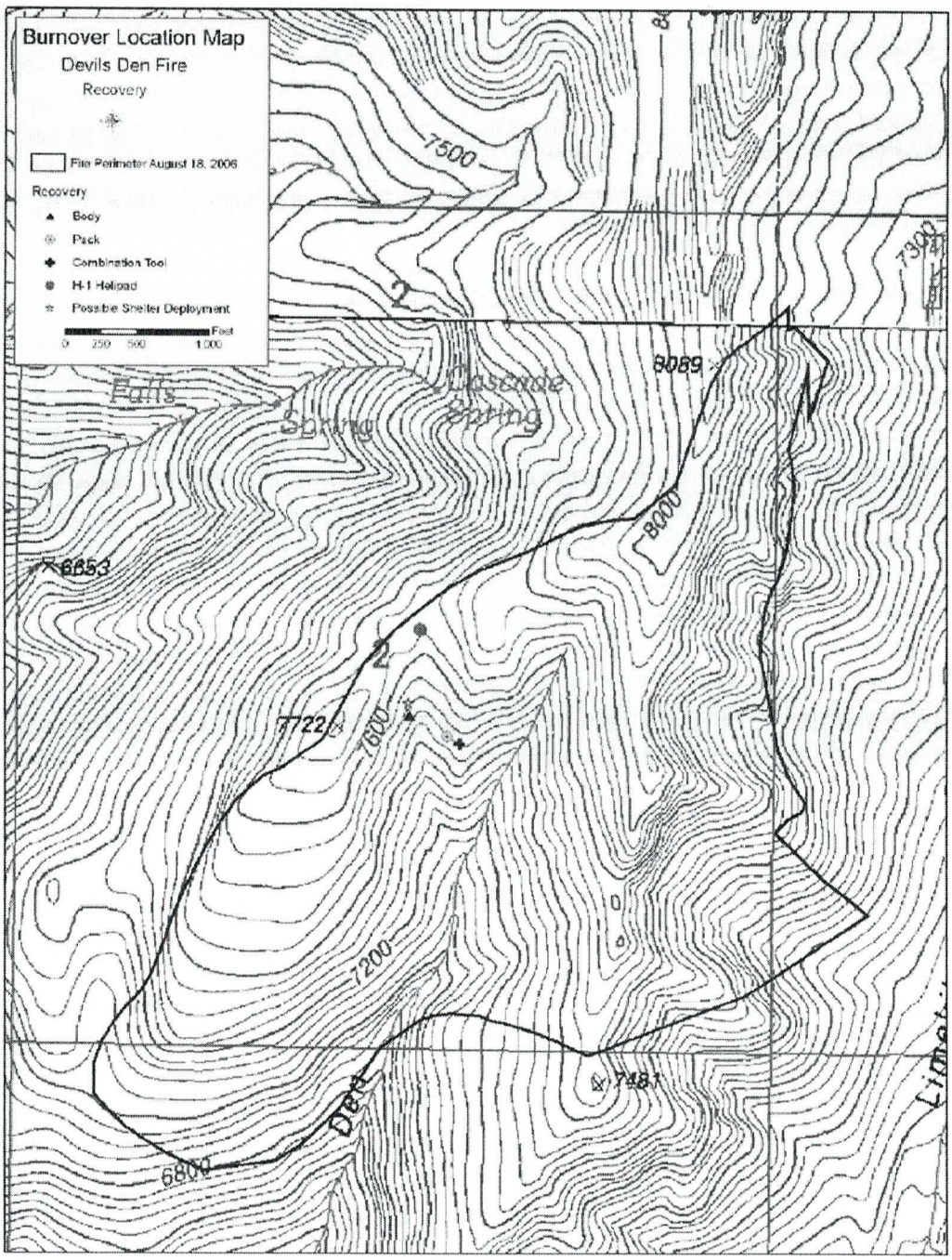
*
Events occurring between time references.

MAPS AND PHOTOGRAPHS

VACINITY MAP

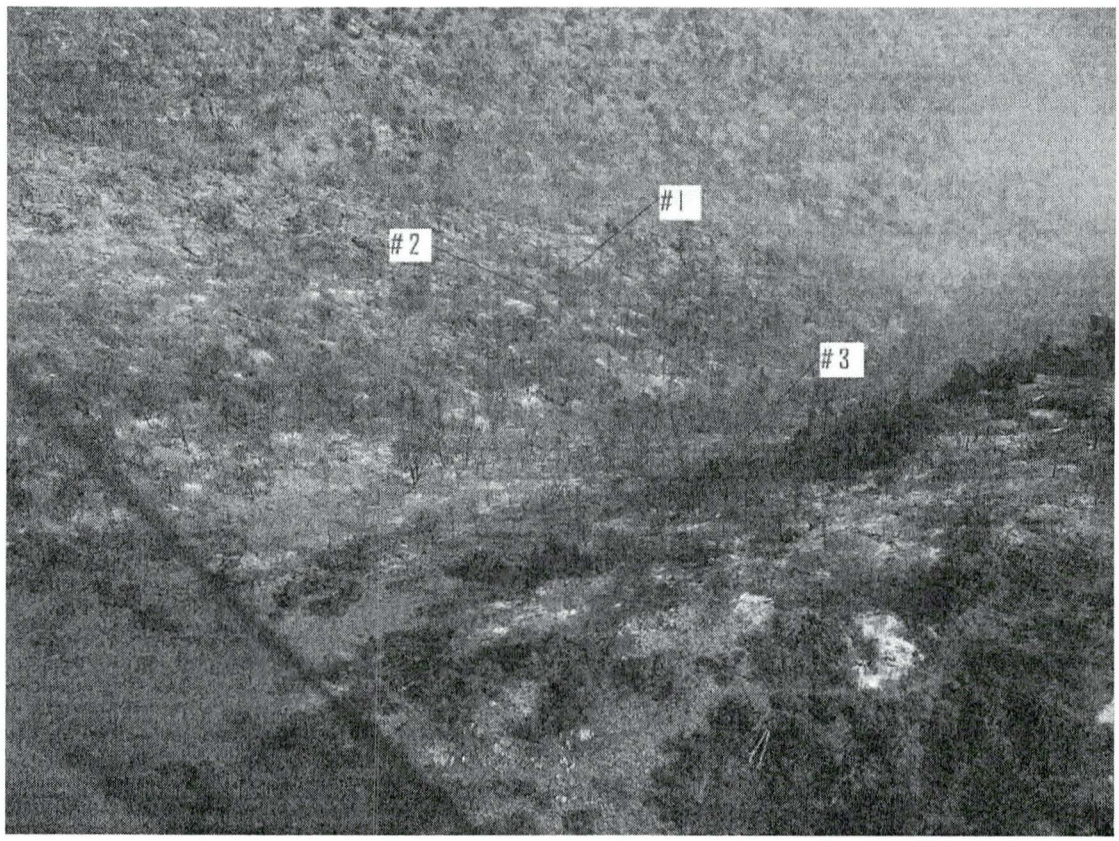


BURNOVER LOCATION MAP



PHOTOGRAPHS

ACCIDENT PHOTOGRAPHIC DOCUMENTATION FORM	
Accident: Devils Den Entrapment and Burn-Over	**Location:** Arial view from helicopter of Devils Den Canyon
Name of Photographer: Fred Johnson, IC Devils Den Incident	**Date/Time Photograph Taken:** 08/17/2006 Approximately 1700
Camera Type: Cannon Power Shot A620 Digital Camera	**Film:** Digital
Description of Photograph: #1 Combination fire tool. #2 Fire pack. #3 Victim location and fire shelter deployment site.	



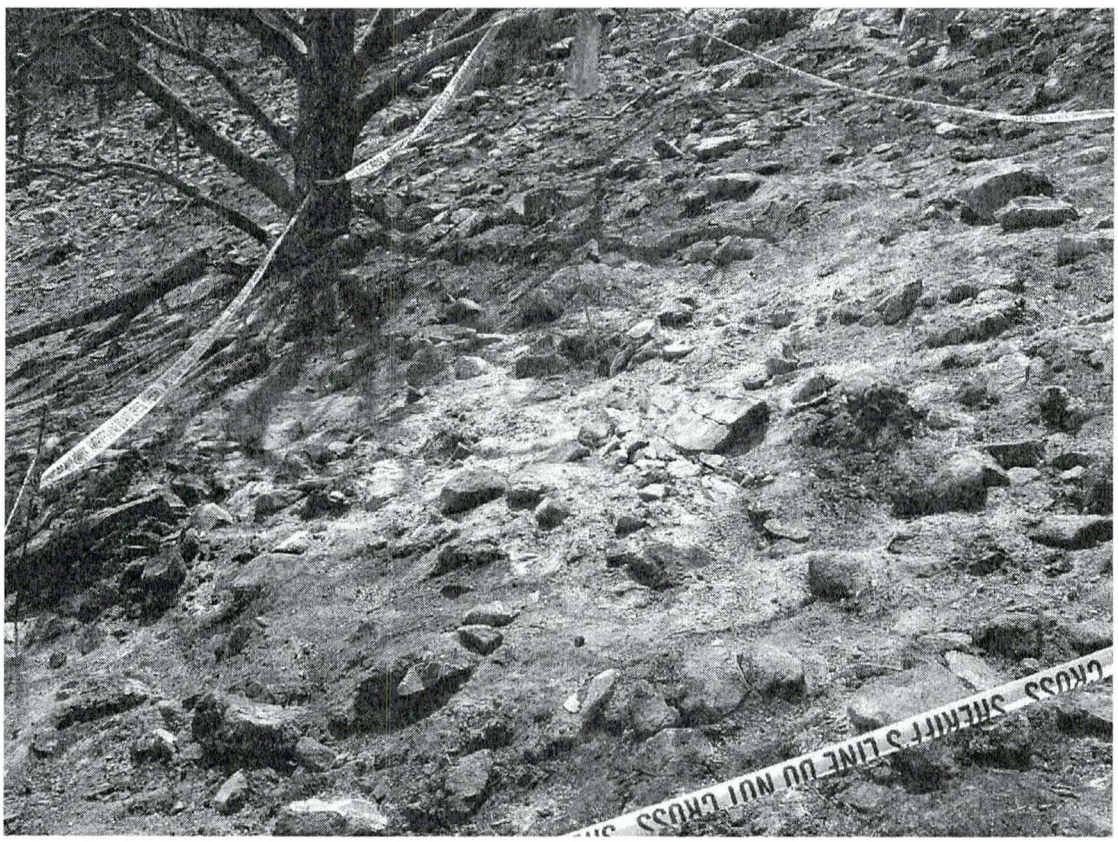
Location of fire tool, fire pack, and victim

ACCIDENT PHOTOGRAPHIC DOCUMENTATION FORM	
Accident: Devils Den Entrapment and Burn-Over	**Location:** Devils Den Canyon
Name of Photographer: Travis Book	**Date/Time Photograph Taken:** 08/19/2006 1437
Camera Type: Fujiffilm, FinePix 3800 Digital Camera	**Film:** Digital
Description of Photograph: Shelter deployment location	

Shelter Deployment Location

ACCIDENT PHOTOGRAPHIC DOCUMENTATION FORM

Accident: Devils Den Entrapment and Burn-Over	**Location:** Devils Den Canyon
Name of Photographer: Travis Book	**Date/Time Photograph Taken:** 08/19/2006 1456
Camera Type: Fujiffilm, FinePix 3800 Digital Camera	**Film:** Digital
Description of Photograph: Final resting place of the victim, head next to the tree, feet next to rocks.	



Final resting place of AFMO

ACCIDENT PHOTOGRAPHIC DOCUMENTATION FORM	
Accident: Devils Den Entrapment and Burn-Over	**Location:** Devils Den Canyon
Name of Photographer: Travis Book	**Date/Time Photograph Taken:** 08/19/2006 1535
Camera Type: Fujiffilm, FinePix 3800 Digital Camera	**Film:** Digital
Description of Photograph: Fire Pack	

Location of fire pack

ACCIDENT PHOTOGRAPHIC DOCUMENTATION FORM	
Accident: Devils Den Entrapment and Burn-Over	**Location:** Devils Den Canyon
Name of Photographer: Travis Book	**Date/Time Photograph Taken:** 08/19/2006 1559
Camera Type: Fujiffilm, FinePix 3800 Digital Camera	**Film:** Digital
Description of Photograph: Combination Fire Tool	

Location of combination fire tool

INVESTIGATIVE PROCESS SUMMARY

A Serious Accident Investigation Team (SAIT) was mobilized on August 18, 2006 for the Devils Den Entrapment/Burn-over that occurred on August 17, 2006 near Oak City, Utah. The Team co-leads were contacted on August 17, 2006 between 6:00-7:00 p.m. When assembled, the SAIT team consisted of 13 interagency members:

- Gust Panos, Team Leader, BLM Deputy State Director-Alaska State Office
- Joel Holtrop, Team Leader, USFS Deputy Chief-Washington D.C.
- G. Sam Foster, Team Leader Shadow, USFS Director, Resource Valuation and Use Research-Washington D.C.
- Jeanette Early, Safety Manager, USFS Safety Manager-Cibola National Forest
- Jan Peterson, Chief Investigator, BLM Safety Manager-Idaho State Office
- Travis Book, Investigator, USFS Law Enforcement Officer-Dixie National Forest
- Kurt La Rue, Fire Operations, BLM Fire & Aviation-National Interagency Fire Center
- Dan Kleinman, Operations Section Chief, USFS-National Incident Management Organization
- Dave Davis, Fire Behavior Analyst, BLM-Battle Mountain District
- Joe Duran, Union Representative, USFS Wilderness Manager-Los Padres National Forest
- Ed Nesselroad, Public Affairs Officer, USFS Director of Public & Government Relations-Region 1 Regional Office
- Marie Bates, Scribe, BLM Fire Training Staff Assistant-National Interagency Fire Center
- Cherie Ausgotharp, Documentation, BLM Fire Program Assistant-Utah State Office

Joel Holtrop received his Delegation of Authority from Hank Kashdan, Deputy Chief for business Operations for the Forest Service; Gust Panos received his Delegation of Authority from Thomas H. Dyer, Director for Office of Fire and Aviation (Acting) for the BLM. The team received an in-briefing from the team co-leads once all initial team members arrived in Fillmore.

The purpose of the SAIT team's investigation as stated by the team co-leads is to provide management with information for accident prevention. Due to the interagency fire program involved in the incident, the SAIT team was selected to reflect this interagency cooperation.

A site visit was conducted on August 19, 2006 by team investigators Jan Peterson and Travis Book. Others in attendance were Gust Panos, Millard County Sheriffs Deputy Tony Peterson. Photographs were taken of the scene and evidence collected. The personal protective equipment of the victim was collected and sent to the Missoula Technology Development Center for identification and analysis. A second site visit was conducted by team membersJoel Holtrop, Kurt La Rue, Dan Kleinman, and G. Sam

Foster on August 24, 2006 for site familiarization and to get a better understanding of the accident scene.

A thorough and outlined process was developed to guide the investigation. Interviews were conducted, reference documents were obtained and reviewed, and evidence gathered. From the information that was collected, facts were highlighted and then compiled into the Accident Investigation Report in the form of Findings, Causal Factors, and Contributing Factors that led to the accident. The SAIT team then developed recommendations to place in the Management Evaluation Report.

The team received assistance from the BLM and Forest Service staff in Fillmore, as well as the BLM Field Office and the Forest Supervisors Office in Richfield. There was close cooperation with Millard County Sheriffs Office and the Millard County Court House for the use of their facility and support.

The 24-hour Devils Den Report was prepared and submitted to the Chief of the Forest Service and the Director of the Bureau of Land Management on August 18, 2006.

The 72-hour Devils Den Report was prepared and submitted to the Chief of the Forest Service and the Director of the Bureau of Land Management on August 21, 2006.

The Accident Investigation Report was reviewed by an interagency Accident Review Board on October 5, 2006.

FINDINGS

These are the conclusions of the investigation team based on the chronology of events and factual data, weight of evidence, professional knowledge, and good judgment. Findings are grouped by category: human, environmental, and material.

Human

Finding 01 -- Key fire leadership personnel were qualified for positions held.
[Red card documentation, training records, individual performance ratings]

Finding 02 -- The ICT4 and ICT4-T managed the Devils Den incident consistent with BLM initial attack policies as a Type 4 incident. However, compliance with Forest Service Thirtymile and Cramer abatement measures applicable on National Forest System incidents was not followed.
[Witness S-1, S-2, records review]

Finding 03 -- Fire leadership and firefighters began the operational period on August 17 with the sense that there was not much fire activity and the day would be mostly mop-up. By midday, conditions had changed.
[Interview I-01, I-07, I-16, I-20, Witness S-11, S-18]

Finding 04 -- By choosing to arrive on the last crew shuttle, the AFMO, ICT4, and ICT4-T were unavailable to provide sound, on-site incident leadership for two hours.
[Witness S-1, S-2, S-5, S-9, S-11]

Finding 05 -- Despite the professional assessment of the ICT4 and ICT4-T, the AFMO went down into the canyon – with the knowledge of a Red Flag Warning for high winds and low humidities – at the height of the burning period.
[Interview I-12, I-13, Witness S-1, S-2, S-29]

Finding 06 -- The AFMO left H-1 in a reconnaissance role but switched to a firefighter role, directing helicopter water drops on spot fires. During this period, the AFMO maintained a mission focus on suppression activities at the expense of situational awareness.
[Witness S-1, S-2, S-11, S-18]

Finding 07 -- The AFMO continued to take direct actions on spot fires after a strategic decision for indirect attack had been agreed upon with the IC4T and IC4T Trainee.
[Interview I-12, I-13, Witness S-1, S-2, S-28]

Finding 08 -- The AFMO delayed leaving the canyon after radio confirmation of spot fires above and below his position, as well as radio communication from the ICT4 and the ICT4-T to get out of the canyon.
[Interview I-12, I-13, Witness S-11, S-14, S-22, S-32, S-36]

Finding 09 -- The AFMO did not address three of the Ten Standard Fire Fighting Orders, eight of the 18 Watch Out Situations, and two components of LCES during his scouting mission of the Devils Den wildland fire incident.
[Site visits, investigation photos, 10/18 LCES Analysis]]

Finding 10 -- When the AFMO finally acknowledged the imminent danger, he ran for safety, dropped his tool, then dropped his pack, and finally attempted to deploy his fire shelter. However, the cumulative effect of his previous decisions led to a situation from which there was no escape.
[Site visits, investigation photos]

Finding 11 -- Agency fire operational policies vary and ultimately may affect firefighter safety in an interagency environment.
[Interagency Standards for Fire and Fire Aviation Operations, Fireline Handbook (Forest Service Handbook 5109.32)]

Environmental

Finding 12 -- Meteorological factors, including a Red Flag Warning (critical fire weather pattern) for the Devils Den incident, posed a significant threat to firefighter safety.
[Salt Lake City NOAA forecast office, Witness S-18, S-26]

Finding 13 -- Macroclimate atmospheric instability and general wind mixing – not a wind shift – influenced and contributed to the blowup at the Devils Den incident.
[FBAN analysis, Salt Lake City NOAA forecast office, Witness S-28]

Finding 14 -- During the blowup, thermal updrafts decreased the effectiveness of water drops and the safe operation of the helicopter required the pilot to return to the helibase.
[Site visit, maps, Witness S-6, S-18, S-26]

Finding 15 -- Fuel conditions and topography played a major role in the blowup.
[FBAN analysis, Great Basin Coordination Center Fuels and Fire Behavior Advisory]

Finding 16 -- A steep rocky slope, rock cliffs, and vegetation hindered escape from the canyon.
[Site visit, site photos]

Finding 17 -- Lack of an adequate deployment site did not allow for effective fire shelter deployment.
[Site visit, site photos]

Material

Finding 18 -- The AFMO had all required personal protective equipment, was trained in its use, and had successfully completed annual proficiency review and work capacity test. *[Training records, Investigation report]*

Finding 19 -- Intense heat in excess of 1610 degrees F and direct flame impingement rendered the fire shelter ineffective.
[Site visits, photos, Missoula Technology and Development Center]

CAUSAL AND CONTRIBUTING FACTORS

Human elements loom large above other factors evaluated in this investigation. Importantly, a questionable decision or a series of questionable decisions appears to have contributed to a situation from which there was no safe escape.

Causal Factors are any behavior, omission, or deficiency that if corrected, eliminated, or avoided probably would have prevented the fatality.

CC-01 -- The AFMO ignored the ICT4 and ICT4-T's assessment to stay out of the canyon.
[F-05, F-16]

CC-02 -- The AFMO lost awareness of blowup potential – Red Flag, fuel, and slope trigger points.
[F-12, F-13, F-14]

CC-03 -- The AFMO lost situational awareness while focused on direct action (coordinating bucket drops and securing spots).
[F-06, F-08, F-14, F-15]

CC-04 -- The AFMO compromised three of the Ten Standard Fire Fighting Orders, eight of the 18 Watch Out Situations, and two components of LCES during his recon mission of the Devils Den wildland fire incident.
[F-05, F-08, F09, F-14, F-16, F-17]

Contributing Factors are any behavior, omission, or deficiency that sets the stage for an accident, or increases the severity of injuries.

CC-05 -- Late arrival of the AFMO on-scene delayed the opportunity to recon the fire at less risk, earlier in the burning period.
[F-04, F-10, F-15]

CC-06 -- Keeping track of differences between Forest Service and Bureau of Land Management standards for fire operations may divert attention from safe fire suppression.
[F-11]

CC-07 -- The AFMO's broader role as acting zone duty officer – encompassing not only the current incident but also evaluating the zone's situation for fire conditions, potential fires, and other considerations – may have affected his situational awareness.
[F-06, F-08, F-09, F-11]

As the Investigation Team completed their work on these causal and contributing factors, we were cognizant of the fact that much of this incident was the result of mistakes made by the victim. At the same time, we want to stress that whatever his thoughts were as he went – and then stayed too long – in the canyon, based on his reputation and experience, we find his intentions were noble, honorable, and in the best interests of his people and the land. His tragically short lapses in judgment should never obscure his greater contributions to wildland fire fighting. Indeed, they should heighten our desire to learn all we can from this accident to help all firefighters be more safe and effective in the future, from novice to the most experienced.

The investigation team believes implementing the forest Service Foundational Doctrine for Guiding Fire Suppression and the series of interagency Leadership Development fire courses leads the agencies to a broader review of fundamental firefighting concepts.

APPENDICES – summaries of reports and analysis prepared as part of the investigation and contained in the investigation files.

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APPENDIX 1 – FIRE BEHAVIOR SUMMARY

On August 17th, 2006 on the Fillmore Ranger District, Fishlake National Forest, just east of Oak City, Utah, a local firefighter lost his life as a result of a burn over incident. A high intensity, short duration fuels, terrain, and atmospheric driven blow-up that lasted for a very short period of time led to the burn over. Exact length of time remains in question due to conflicting time lines given in witness statements and interviews. The best estimate is between 15 minutes and 30+ minutes for the entire event from initialization of the blow-up through the small slop-over across the top of the ridge. This incident occurred while the firefighter was scouting the fire as well as attempting to mop-up two or more spot fires above the main fire. The main fire was located below the spots – and thus the firefighter – in very steep terrain and a rugged, narrow chimney.

A Red Flag Warning for strong winds and low relative humidities, both resulting from a dry cold frontal passage, was in effect for the local fire weather zone. This warning, identified as the result of reviewing remote area weather stations' (RAWS) located around the region, did materialize as forecasted. The observed local winds on the fire, however, appear to have been unaffected by the general winds as a result of a sheltering effect at the fire site. This sheltering or reduction of wind effects on the fire is a result of the complex terrain that exists on the Canyon Mountain Range. The sheltered (reduced) local winds do not appear to have significantly contributed directly to the blow-up. Further, there is no observed wind shift (change in direction) that was stated by any witnesses. The Red Flag level general winds did, however, appear to contribute, through mixing, to the overall atmospheric instability. This factor, combined with a forecasted Haines Index of a 5, moderate, is likely to have significantly contributed to the blow-up situation that occurred.

The five local trigger points (thresholds) identified on the Richfield Interagency Fire Center (RIFC) website under fuels data indicate that at least four (4) of the five (5) were present on the fire site.

- Relative humidity less than 20 percent
- Temperature greater than 85 degrees F
- Live fuel moisture less than 100 percent in sagebrush and 90 percent in juniper
- Haines Index of 5 or 6

As noted: "Combinations of any of these four factors can greatly increase fire behavior."

At least three (3) of the four (4) "Common Denominators of Fire Behavior on Tragedy Fires" were present on the fire site.

- On relatively small fires or deceptively quiet areas of large fires
- In relatively light fuels such as grass, herbs, and light brush
- When fire responds to topographic conditions and runs uphill

According to the Incident Response Pocket Guide, alignment of topography and wind during the burning period should always be considered a trigger point to re-evaluate strategy and tactics.

The blow-up and resultant extreme fire behavior as observed in brief video clips supplied by the Air Attack pilot validate the Fuels and Fire Behavior Advisory issued by the Great Basin Coordination Centers in July, 2006.

FIRE BEHAVIOR PARAMETERS AND THEIR ALIGNMENT ON THE DEVILS DEN WILDLAND FIRE, AUGUST 17TH, 2006

PARAMETERS	ALIGNMENT
Haines Index 5, moderate	Relative humidity 19% and declining toward a low of 14%
Haines Index (and thus atmospheric instability) at or near its peak	Total live fuel moistures (TLFMs) in 1, 10, and 100 hour fuels at or near their lowest for the time of day
Red Flag Warnings for strong winds, low relative humidities, and a cold front passage were forecast and did materialize	Generally, atmospheric winds above the fire contributed significantly to the overall instability above the fire
Temperature of 82 degrees F, moving toward 84 degrees F	Southwest aspect
Time of day between 1330 hours and 1430 hours	Solar heating on southwest aspect at its peak
Diurnal wind effects at their strongest	Fuels heating and temperature at its peak
General atmospheric winds at or near their forecast peak	Juniper foliar moisture well below thresholds for extreme fire behavior
Keetch-Byram Index was trending toward extreme fire conditions	1000 hour TLFMs were at 6-7% (kiln dried lumber is normally 12-18%)
Sagebrush foliar live fuel moisture was at the high fire behavior level, trending toward extreme	Carry-over of perennial fuels; heavy fuel loading of fine, dead, tall fuels; high dead to live fuel ratios
Slope in Devils Den was extreme, ranging from 49% at the accident site to greater than 60% below the accident site	Spotting potential probability of ignition was near 90%
The accident site was located in a small drainage within a chimney	Perennial grasses were cured or nearly cured (very low foliar moisture)
Closed canopy/tight crown spacing of pinyon/juniper limited mobility and available escape routes	Firefighter was above the main fire with green/cured fuel between him and the main fire below, in a chimney
Significant ladder fuels in the canopy	Spot fires were present; pre-treatment of ladder fuels was on-going before the blow-up

Changing column and smoke color was occurring before the blow-up	Trees were torching individually and in groups prior to the blow-up
3 of 4 common denominators were present prior to blow-up	Observed escape route was steep and uphill
	No viable safety zone was available or reachable

The complete fire behavior analysis appears in the investigation files.

APPENDIX 2 – FIRE OPERATIONS SUMMARY

Resources began moving to the fire scene early in the morning of August 17, 2006. While some resources were new to the fire, many were responding to their second shift on the Devils Den incident. The standard morning briefing was facilitated by the Assistant Fire Management Officer (AFMO) and given at 0830 hours to the local unit and severity resources at the Fillmore Interagency Fire station before heading to the fire. This briefing included daily assignments, 6 minutes for safety, and the weather forecast.

At 0600 hours the Arizona Strip Fuels crew started their duty day in St George, UT. At 0730 hours the Color Country crew supervisor received his resource order for the Devils Den incident from the Color Country Interagency Fire Center (CCIFC). The Color Country crew left Cedar City at 0800 hours for Oak City, UT. At 0800 hours the AFMO, Incident Commander Type 4 (ICT4, or simply IC), and the ICT4-T met at the AFMOs office and discussed the current fire situation and suppression plan for August 17. The AFMO then met with the Fillmore District Ranger and reviewed operational issues. At that time it was agreed that if progress towards containment was not made by 1400 hours they would develop a Wildland Fire Situation Analysis (WFSA) for the incident. At 0845 hours a briefing was held with the Engine Boss for E-111, the IC, and the crew superintendent trainee of the Fillmore Handcrew. This briefing included a discussion of the fire situation with an understanding that a more complete briefing would be given at H-1 prior to assignment. At 0930 hours the Arizona Strip Fuels crew arrived at the helibase and received their briefing at 1030 hours. At 0936 hours the ICs called dispatch and went in service to the incident. At 0945 hours the Zion Helitack Manager flew the fire and sized it up as messy, no smoke, and a mess to clean up. Approximately between 1000-1015 hours the Color Country Handcrew met with the IC in Oak City and followed him to the helibase. No briefing was given at that time. At 1023 hours the ICs tied in with the Arizona Strip Fuels (ASF) crew. At 1030 hours the ASF crew was briefed on fire conditions. Around 1045 hours Color Country Handcrew arrives at the helibase and is informed they are to be flown to the fire. They are told the safety zone is the black and their manifest is taken to get the crew ready for flight. At 1045 hours helitack personnel are flown to H-1; they report seeing little smoke on the flight in. Over the next two hours the crews received their pre-flight helicopter briefing and were flown into the fire in groups of 3-4 with the ICs and AFMO arriving at H-1 on the last flight. Crews being flown to H-1 reported they flew directly to the site and saw little or no fire activity. The most common comment was that they were looking at a mop-up shift.

By 1230 hours the crew shuttle to H-1 was complete. The crews were en-route or already at the lunch site/safety zone. The IC and his trainee were at H-1 with the AFMO.

Between 1230-1245 hours the ICs and AFMO discussed tactics. At that time they separated with the ICs moving toward the crews and the AFMO walking into the canyon to review the options available. During the meeting at H-1 the ICs expressed their concerns about the proposed direct line and the AFMO's plan to walk into the canyon above the one smoke they had seen in the bottom of the drainage on the flight in. The

AFMO and ICs discussed a "Plan B" of burning the ridge tops around the canyon at that time and the ICs strongly urged the AFMO to not recon the canyon. The AFMO replied that he would be OK and left H-1 heading down the southwest facing slope toward the smoke. At 1241 hours the IC trainee ordered single engine air tankers (SEATs) and Air Attack launched to support their "Plan B" operations.

During the time the ICs and AFMO were meeting at H-1, the crew supervisors were at an overlook near the lunch/safety zone assessing the same smoke that the ICs were looking at. This smoke was located at the base of their downhill line construction assignment and the consensus of the crew supervisors was that cutting direct line downhill toward the smoke was not a viable plan. When the ICs arrived at the rock overlook the crew supervisors voiced their concerns and one of the crews told the IC that they will not be available to support the assignment. The ICs and crew supervisors agreed to use Plan B and cut an indirect line, to be fired later, around the top of the canyon.

By approximately 1300 hours the crewmembers were at the safety/lunch site and the crew supervisors agreed on the tactics to implement Plan B. The weather was taken at 1300 hours with a temp of 82F, relative humidity of 19%, and winds 5-10 SW. This information was broadcast and heard by a variety of personnel on the fire. It was around this time that an increase in the amount of smoke and a general increase in the fire activity were noted by personnel on the ridge. The ICs informed the AFMO that they favored the use of Plan B. The AFMO reported back that due to the fuels and slope conditions he was good with Plan B.

Between 1300-1330 hours the AFMO ordered helicopter support for the lowest spot in the drainage. Until that time many of the crew supervisors were unaware that the AFMO was in the drainage. The consensus of the crew supervisors was that the AFMO should leave the area immediately. This concern was passed on to the ICs who again told the AFMO of their concerns as to his location and advised him to leave the canyon.

Between 1330 and 1340 hours the IC informed the AFMO that there was now a spot fire above him and that the AFMO was in a tight spot. The AFMO continued to hold his location and to direct the bucket work on the spots below him. At around 1340 hours the helicopter pilot confirms there was a spot above him. The helicopter dropped on the upper spot and the AFMO began to move toward it. The helicopter made a second drop on the upper spot with the AFMO still below it and returned to the dip to reload. The IC told the AFMO to leave the area. The AFMO replied that he would stay and work the spots.

At around 1345 hours the fire rapidly began to spread uphill. Upon the helicopters return it was unable to drop due to fire conditions. The helicopter could no longer effectively support the AFMO with buckets because of the turbulence caused by the fire activity and returns to the helibase. As the fire continued to rapidly spread up the canyon, the IC told the AFMO to run to the northwest. The AFMO began to move up and away from the fire. The IC told the AFMO to drop his pack and run, this request was repeated by both

ICs numerous times. At 1350 hours the AFMO replied back that he was in trouble and did not respond to further radio calls after 1353 hours.

At 1350 hours the smoke column is clearly visible to all personnel. The ICs were attempting to give direction to the AFMO to aid his egress from the fires' path. The helicopter was requested to return and assist. At 1400 hours the IC notified dispatch of a possible missing person and ordered Air Med. All personnel who were not already in the safety zone were pulled back into the safety zone, and the crews began to account for all personnel. The IC sent folks to H-1 so they can be in place to help with any helicopter/medical tasks that may arise. At 1406 hours the IC stopped SEAT operations on the fire. At 1415 hours, notification of a possible entrapment was made to management personnel and dispatch. Crews began to walk from the safety zone back to the helibase. At 1438 hours all crews were off the fire except the individuals taking part in the search and recovery efforts. Some individuals were trying to work into the canyon bottom but they were stopped by excessive heat. At 1546 hours a new IC arrived at the helibase. The search continued as the area cooled down enough to allow personnel to enter the canyon. At 1645 hours the body of the AFMO was found and at 1700 hours the IC was notified that no medivac was needed.

APPENDIX 3 – 10/18 AND LCES ANALYSIS SUMMARY

Ten Standard Fire Fighting Orders

Summary: Three of the Ten Standard Fire Fighting orders were compromised by the AFMO during his scouting mission of the Devils Den wildland fire incident.

The AFMO really had little or no choice of an adequate escape route or safety zone at the time of the fire. His location in the chimney; in heavy fuels; in steep, rocky terrain; above the main body of the fire; at 1350 hours in the afternoon; on a southwest aspect; in mid-August; and in southwest Utah where extreme fire behavior had been exhibited and observed for the last five plus weeks all aligned to drive the high intensity/short duration event that claimed the life of the AFMO.

The AFMO's failure to implement and follow three of the Ten Standard Fire Fighting Orders contributed significantly to the burnover accident.

1) *Keep informed on fire weather conditions and forecasts.* Met: statements and interviews indicate everyone was aware of the fire weather conditions and forecasts.

2) *Know what your fire is doing at all times.* Met: the lookouts kept the victim apprised of what the fire was doing; right through the time of the blow-up.

3) *Base all actions on current and expected behavior of the fire.* **Failed to follow**: the AFMO did not anticipate the blow-up of the fire.

4) *Identify escape routes and safety zones, and make them known.* **Failed to follow**: the AFMO had placed himself in a closed canopy pinion/juniper stand on a steep slope, in a chimney, above the main body of the fire with green vegetation between his location and the main fire. Steep terrain, combined with extensive rocky footing and heavy vegetation existed prior to the burnover. The entire area above the fire had neither a satisfactory escape route nor any obvious safety zones in any direction.

5) *Post lookouts when there is possible danger.* Met: adequate numbers and qualified lookouts had been posted on the rim above the fire.

6) *Be alert. Keep calm. Think clearly. Act decisively.* Met: to the best of the team's knowledge, the ICs and the victim followed this fire order.

7) *Maintain prompt communications with your forces, your supervisor and adjoining forces.* Met: verbal and radio communications were adequate and proper.

8) *Give clear instructions and insure they are understood.* Met: even though the ICs provided clear, understandable advice not to go down in the canyon. The AFMO opted to recon the fire.

9) *Maintain control of your forces at all times.* Met, but questionable: The role of the AFMO confused the ICs and their role as responsible for managing the incident.

10) *Fight fire aggressively, having provided for safety first.* **Failed to follow**: the fact that fire orders numbers three (3) and four (4) were compromised indicate this order was not met.

18 Watch Out Situations

Summary: Eight of the 18 Watch Out Situations were compromised by the AFMO during his scouting mission of the Devils Den wildland fire incident. It is unclear whether or not an additional situation was adequately met.

The AFMO was focused on directing water bucket drops and suppressing spot fires in the canyon, apparently following an already discarded strategy. The spots were not anchored. His position above the main fire, in a chimney with heavy fuels between him and the main fire, was extremely dangerous. The AFMO seemed unresponsive to the height of the burning period and prevailing weather that had led to blowup conditions over previous weeks. The existing vegetation, terrain, and rocky footing all combined so that escape routes or safety zones were not available at the head of the main fire in the chimney.

The AFMO's failure to implement and follow eight of the 18 Watch Out Situations contributed significantly to the burnover accident

1) *Fire not scouted and sized up.* Met, but questionable: the AFMO was performing this very function at the time of the accident.

2) *In country not seed in daylight.* Met: the fire was sized up and managed from the day before, August 16th, 2006.

3) *Safety zones and escape routes not identified.* **Failed to follow**: as stated in the analysis of the Ten Standard orders, there were no adequate safety zones or escape routes above the main fire that was located in the Devils Den Canyon on August 17th, 2006.

4) *Unfamiliar with weather and local factors influencing fire behavior.* Met: the AFMO and all the fire fighters were aware of the forecasted weather conditions as well as the existing dry fuel conditions.

5) *Uninformed on strategy, tactics, and hazards.* **Failed to follow**: while the ICs and fire fighters were beginning or planning to implement "Plan B", the AFMO was still acting on "Plan A": direct attack on what was prior to the blow-up, a smoldering, low intensity ground fire. This is witnessed by the fact that the AFMO was directing water bucket drops from the helicopter even as the fire transitioned into the blowup.

6) *Instructions and assignments not clear.* Met, but questionable: The failure of the AFMO to transition from "Plan A", direct attack of the perimeter, to "Plan B", burn out at the ridge, led to his remaining in the chimney above the main fire; even as the fire was transitioning from a possible direct attack tactics fire to a blow-up situation. The ICs had already determined to move to "Plan B", burn-out at the ridge line; so the instructions and assignments of the ICs was clear. The failure of the AFMO to be "in tune" with these changes, as witnessed by the continued direct attack of the spot fires by the helicopter (as directed by the AFMO) indicates a lack of clarity on the AFMO's part.

7) *No communication link with crew members or supervisor.* Met: All indications were that communications were adequate for the job at hand.

8) *Constructing line without safe anchor point.* **Failed to follow**: the AFMO was above the main fire, in a chimney, directing helicopter bucket drops on two or more spot fires. Since the main fire was not anchored, the spots were thus not anchored.

9) *Building fireline downhill with fire below.* Met: no one at the time of the accident was constructing fire line down hill.

10) *Attempting frontal assault on fire.* Met: the ICs plans did not include any frontal assault of the fire.

11) *Unburned fuel between you and fire.* **Failed to follow**: as mentioned previously, the AFMO was above the main fire, in a chimney with heavy fuels between him and the main fire.

12) *Cannot see main fire; not in contact with someone who can.* Met: adequate and qualified lookouts were posted and in contact with the AFMO.

13) *On a hillside where rolling material can ignite fuel below.* Unknown: roll-out of material may well have contributed to the spotting and increasing intensity of the smoldering, low intensity ground fire that existed prior to the blow-up. It is easy to hypothesize this phenomenon, because of the terrain and fuels; but it would be harder to verify. Witness statements do not refer to this type of activity occurring.

14) *Weather becoming hotter and drier.* **Failed to follow**: the alignment of: time of day; dropping relative humidities; maximum temperature and solar heating of fuels located on a southwest aspect; maximum diurnal wind influence; probably the peak of the Haines 5, moderate index; maximum mixing of atmospheric winds above the fire all likely led to the blow-up and resulting burn over that occurred.

15) *Wind increases and/or changes direction.* **Failed to follow**: the witness statements mention no significant increase of wind speed at **THE SURFACE** (except those caused by the thermal activity of the blow-up) which would have led to increased fire activity; nor was there any mention of a wind shift. The remote area weather stations located around the region, were however, indicating that the "Red flag Warning" that had been forecast for strong winds and low relative humidities was and had been occurring around the region. This event was caused by the passage of a cold front. The complex terrain in and around the Devils Den Canyon likely sheltered the wild fire from any noticeable wind increases or shifts. The strong winds aloft, however, contributed significantly to the already unstable air mass above the fire; thus directly contributing to the blow-up and resulting burn over.

16) *Getting frequent spot fires across line.* **Failed to follow**: Witness statements indicate several spot fires ahead and around the main fire body.

17) *Terrain and fuels makes escape to safety zones difficult.* **Failed to follow**: As noted above, existing vegetation, terrain, rocky footing all combined so that escape routes or safety zones were not available at the head of the main fire in the chimney.

18) *Taking a nap near fireline.* Met: there is no indication this occurred.

LCES (Lookouts, Communications, Escape routes, Safety zones)

With firefighters and leadership positioned above the canyon and in the air, lookouts were more than adequate. Communications was excellent, with people not only able to communicate, but many firefighters were able to overhear radio communications clearly. Escape routes and safety zones were adequate for most of the firefighters. In fact, several crews ate lunch in the black while awaiting instructions from the ICT4 and ICT4-T. The AFMO really had little or no choice of an adequate escape route or safety zone at the time of the fire. His location in the chimney; in heavy fuels; in steep, rocky terrain; above the main body of the fire; at 1350 hours in the afternoon; on a southwest aspect; in mid-August; and in southwest Utah where extreme fire behavior had been exhibited and observed for the last five plus weeks all aligned to drive the high intensity/short duration event that claimed the life of the AFMO.

APPENDIX 4 – STANDARDS FOR FIRE OPERATIONS ANALYSIS SUMMARY

Issue:

Varying standards for fire operations by agency and jurisdiction may affect firefighter safety in interagency incident management.

Discussion:

In many wildland fire emergencies, incidents area managed by cooperating agencies under the authority of the: *INTERAGENCY AGREEMENT FOR FIRE MANAGEMENT BETWEEN THE BUREAU OF LAND MANAGEMENT, BUREAU OF INDIAN AFFAIRS, NATIONAL PARK SERVICE, U.S. FISH AND WILDLIFE SERVICE, OF THE UNITED STATES DEPARTMENT OF THE INTERIOR AND THE FOREST SERVICE OF THE UNITED STATES DEPARTMENT OF AGRICULTURE. BLM AGREEMENT NO.: 1422RAI03-0001; BIA AGREEMENT NO.: AG 2002-K097; NPS AGREEMENT NO.: F0001-03-0011; FWS AGREEMENT NO.: 93252-3-H-001; FS AGREEMENT NO.: 02-IA-11132543-21*

This agreement enables significant and necessary efficiencies between agencies as it allows any of the cooperating agencies to provide fire management services on any other agency's jurisdictional lands. All authority for fire management activities, however, is retained by the jurisdictional agency administrator.

Concern:

There are few, but nevertheless meaningful differences between Forest Service and Bureau of Land Management standards for fire operations. For example

Interagency Standards for Fire and Fire Aviation Operations (Red Book)	Forest Service Handbook 5109.32 (Fireline Handbook)
ESCAPED INITIAL ATTACK A fire has escaped initial attack when: • The fire has not been contained by the initial attack resources dispatched to the fire and there is no estimate of containment or control and; • The fire will not have been contained within the initial attack management objectives established for that zone or area.	**ESCAPED FIRE:** Fire that has exceeded or is expected to exceed initial attack capabilities or prescription. **EXTENDED ATTACK:** Situation in which a fire cannot be controlled by initial attack resources within a reasonable period of time. The fire usually can be controlled by additional resources within 24 hours after commencing suppression action.

Under both agencies policies, a Wildland Fire Situational Analysis (WFSA) is required when a fire becomes an "escaped fire." Under Forest Service policy, a WFSA is required

when the initial forces cannot contain the fire. Under Bureau of Land Management policy, initial attack resources could be overwhelmed, and numerous reinforcing resources called in on subsequent days, as long as the incident commander has an estimate of containment, the fire has not "escaped."

On smaller incidents, such as initial and extended attack, agencies develop reciprocal or mutual aid agreements with Annual Operational Plans to enable rapid response by cooperating agencies without being encumbered by incident specific authorizing documentation. Typically these documents do not specify compliance with host agency safety procedures; rather, they rely on each agency to comply with their own safety procedures.

Concern:

The jurisdictional line officer is required to manage the incident under the laws and policies of the jurisdictional agency hosting the incident. There is little concern with managing resource impacts in compliance with host agency standards, as these can easily be described in the cooperating agreements. There is high concern, however, with different agency policies that effect human safety. In particular the point where a fire is determined to be escaped is significant because, as stated in FSM 5130.3.4.b.; "*Transition from initial attack to extended attack can be especially dangerous. During this transition, the fire shall be managed as a potentially life-threatening event.*"

Summary:

Agency administrators do not have the authority to accept the operating standards of other agency resources except for qualification standards. Local Mutual Aid and Cooperating Agreements do not specify that the standards of the jurisdictional agency prevail, and thus jurisdictional standards provide the rules of engagement.

APPENDIX 5 – COMPLIANCE ANALYSIS SUMMARY

Thirtymile Hazard Abatement – Monitoring Checklist

- See Devils Den Thirtymile Hazard Abatement – Monitoring Checklist
- Not a standard for other wildland fire agencies, Forest Service specific.

Summary: Not fully adhered to. The AFMO was a BLM employee working on a FS Fire during initial attack. The national cooperating agreement does not provide clear jurisdictional standards to incident commanders operating outside of a WFSA, such as during initial attack, on another agency's jurisdiction.

Cramer Fire Accident Prevention Plan

- District Ranger reported to the Fillmore Ranger District on Aug 6, 2006. This was his first permanent assignment as a District Ranger. He was not the agency administrator.
- Not a standard for other wildland fire agencies, Forest Service specific.

Summary: During periods of transition to new management, a qualified line officer, familiar with the area, Region and WSFA should be assigned to assist new or incoming line officers.

Personnel Medical Surveillance Folders

Employee medical surveillance records were reviewed.

Summary: Nothing of significance noted.

Employee IQCS Qualifications

IQCS qualifications for employees were reviewed.

Summary: All met IQCS standards

Leadership Training

Both the IC4 and ICT4-T attended L-380 Fireline Leadership. The AFMO did not take this training, because it was neither developed nor required at the time he qualified for his position.

Summary: Fireline leadership training provides addition tools and awareness of human factors. The AFMO was "grandfathered" into this requirement, as the training was developed and after he was already in position. He met all qualification requirements. It is unknown whether completion of this training by the AFMO would have influenced a different outcome.

Duty Officer

- Duty Officer Standards
  - Fishlake National Forest Fire Management Plan describes the qualifications and experience needed of the Duty Officer as "useful." The qualifications and experience are not required.
  - FSM 5126.4 under IFPM directs specific qualifications either current or have been for Duty Officers with High, Moderate, and Low Complexities on a given unit.

- Duty Officer Roles
  - Fishlake National Forest Fire Management Plan describes the responsibilities of the Duty Officer.

The following is from the Fishlake National Forest Fire Management Plan pages 110 and 111.

Zone Fire Management Officers manage all aspects of the interagency fire management program in coordination with the responsible sub-unit Line Officer or Officers (District Rangers and Field Office Managers).... A Zone FMO or acting and a FOS or acting will be assigned and available for each zone and each area of responsibility throughout the fire season.

The Zone FMO or acting must have qualifications and experience that have demonstrated proficiency safely managing incidents and resources at the zone level...Wildland fire qualifications useful to recognize these conditions include, Incident Commander Type 3 (ICT3), Division Supervisor (DIVS) and Type 2 prescribed Fire Burn Boss (RXB2) or Safety Officer (SOF2).

The Zone FMO is responsible for implementation of the wildland fire program as defined by this Fire Management Plan. These responsibilities include:

- *Monitor fire management fatigue by monitoring work/rest guidelines.*
- *Assist line officers in the completion of Wildland Fire Situation Analysis (WFSA) and Wildland Fire Implementation Plans (WFIP).*
- *Monitor the area FOS in the Zone and assess performance and level of fatigue.*
- *Monitor fires that are in the transition phase to ensure plans are complete and incident command system is clear and functioning.*
- *Monitor incidents to ensure that the incident complexity matches the IC qualifications.*
- *Monitor fire management operations to ensure the 10 Standard Orders and 18 Situations that shout watch-out are followed.*
- *Assess after action reviews for trends and implement corrective actions.*

*The area **duty officer** is responsible for implementation of the wildland fire program as defined by this Fire Management Plan. These responsibilities include:*

- *Make initial recommendation for either appropriate suppression response or potential candidate Wildland Fire Use to the responsible line officer.*
- *Insure fire management work/rest guidelines are followed.*
- *Assist Line officers in the completion of Wildland Fire Situation Analysis (WFAS) and Wildland Fire Implementation Plans (WFIP).*
- *Complete transition plan for fire changing from the initial response to the extended attack.*
- *Ensure incident command system is clear and functioning.*
- *Ensure that the incident complexity matches the IC qualifications.*
- *Direct a "pull off" or "disengagement" of an incident if it exceeds the qualifications of the incident commander.*
- *Monitor fire management operations to ensure the 10 Standard Orders and 18 Situations that shout watch-out are followed.*
- *Complete after action reviews*

Summary: AFMO was the Duty Officer for the date. He was qualified under the Interagency Fire Program Management (IFPM) Qualification Standards at the High Complexity level.

Complexity Analysis

The complexity analysis located in the Great Basin Incident Organizer (GBIO) contains the Complexity Analysis worksheet.

- Devils Den Complexity Analysis
  - 10 of the 18 of the analysis boxes had been completed
  - Unsure which day or time the analysis was worked on.
  - Of the 10 analysis boxes that were completed, 4 were marked yes. Per instructions for types 3, 4 and 5 fires, if 3 to 5 boxes were marked yes, consider requesting the next level of incident management support.

Summary: The current Complexity Analysis process does not provide the ability to update and change. Levels and language used to guide the analysis are somewhat complex. Questions asked could exceed the operational level and experience of the person doing the analysis, especially at the type 4 and 5 fire level. There is no clear reference.

Spot Weather Forecast

Per 2006 Fishlake National Forest Fire Management Plan, page 97 1st paragraph; *"Spot forecasts should be used prior to activating prescribed burning and to determine fire behavior on uncontrolled fires".*

Red Book Chap 10 Page 10-4, Spot Weather Forecast: *"Spot weather forecasts must be requested for fires... located in areas where Fire Weather Watch or Red Flag Warnings have been issued."*

Summary: A spot weather forecast was not obtained on the day of the incident although there had been a Fire weather watch the day before and witnesses' statements and weather reports confirm "Red Flag Warnings" were in effect on the day of the incident.

IQCS

- 310-1 vs. FSH 5109.17

The only authorized variance permitted to Forest Service Line Officers is with respect to accepting other agency standards for firefighter qualifications: Ref: NWCG memorandum of March 22, 2004 which states:

Subject: Qualification Standards during Initial Action

There appears to be varying interpretations within the federal agencies regarding the application of 310-1 qualification/certification standards to local, non-federal resources, particularly during initial action. The following points summarize NWCG policy.

- The 310-1 qualification/certification standards are mandatory only for national mobilization of wildland fire fighting resources.
- During initial action, all agencies (federal, state, local and tribal) accept each other's standards. ***Once jurisdiction is clearly established, then the standards of the agency(s) with jurisdiction prevail.***
(Emphasis Added)

Summary: Agency Administrators do not have the authority to accept the operating standards of other agency resources except for qualification standards. Local Mutual Aid and Cooperating Agreements do not specify that the standards of the jurisdictional agency prevail and thus jurisdictional standards provide the rules of engagement. In certain instances Department of Interior Incident Commanders operating on Forest Service jurisdictional lands may not be complying with critical Forest Service safety standards (for example, Thirtymile Hazard Abatement/Mitigation standards). This fact may increase the safety risk of firefighters and liability risks of Forest Service Agency Administrators.

Fire Shelter

Per MTDC, the fire shelter in the AFMO's possession was an approved fire shelter.

Policies

Policies were viewed. Numerous differences can be found.

Examples:

- Duty Officer qualifications for personnel that serve as on-call leadership and supervision for all wildland fire suppression incidents. FS 5126.4 requires, BLM does not.

- Forest Service and Bureau of Land Management definition of escaped initial attack vs. extended attack.

- Spot weather forecast shall be provided for fires that exceed initial attack. Different requirements in different manuals and appendixes.

Overall Summary: Written direction for the management of fires is numerous, confusing and in some cases contradictory. There are separate or additional requirements that relates specifically to the Agency which is responsible for managing the fire. Forms are duplicated with different names. As we continue to work in a interagency environment the differences for Department of Interior Personnel and Department of Agriculture personnel does not appear until trying to sort which policies must be complied with on which fire. The lack of unified definitions, common and standard language could easily affect the method and manner the fire is managed.

APPENDIX 6 – GLOSSARY

Agency: Any federal, state, or county government organization participating with jurisdictional responsibilities.

Anchor Point: An advantageous location, usually a barrier to fire spread, from which to start building a fire line. An anchor point is used to reduce the chance of firefighters being flanked by fire.

Aspect: Direction toward which a slope faces.

Backfire: A fire set along the inner edge of a fire line to consume the fuel in the path of a wildfire and/or change the direction of force of the fire's convection column.

BLM: Bureau of Land Management, a land and resource management agency of the Department of the Interior.

Blow-up: A sudden increase in fire intensity or rate of spread strong enough to prevent direct control or to upset control plans. Blow-ups are often accompanied by violent convection and may have other characteristics of a fire storm. (See Flare-up.)

Bucket Drops: The dropping of fire retardants or suppressants from specially designed buckets slung below a helicopter.

Burn Out: Setting fire inside a control line to widen it or consume fuel between the edge of the fire and the control line.

Contain a fire: A fuel break around the fire has been completed. This break may include natural barriers or manually and/or mechanically constructed line.

Direct Attack: Any treatment of burning fuel, such as by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.

Dispatcher: A person employed who receives reports of discovery and status of fires, confirms their locations, takes action promptly to provide people and equipment likely to be needed for control in first attack, and sends them to the proper place.

Dispatch Center: A facility from which resources are directly assigned to an incident.

Drop Zone: Target area for air tankers, helitankers, and cargo dropping.

Entrapment: A situation where personnel are unexpectedly caught in a fire behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised.

Escape Route: A preplanned and understood route firefighters take to move to a safety zone or other low-risk area, such as an already burned area, previously constructed safety area, a meadow that won't burn, natural rocky area that is large enough to take refuge without being burned.

Extended Attack Incident: A wildland fire that has not been contained or controlled by initial attack forces and for which more firefighting resources are arriving, en route, or being ordered by the initial attack incident commander.

Fire Behavior: The manner in which a fire reacts to the influences of fuel, weather and topography.

Fire Line Handbook: Interagency handbook of terms, positions, and functions for wildfires.

Fire Shelter: An aluminized tent offering protection by means of reflecting radiant heat and providing a volume of breathable air in a fire entrapment situation.

Fire Shelter Deployment: The removing of a fire shelter from its case and using it as protection against fire.

Firefighting Resources: All people and major items of equipment that can or potentially could be assigned to fires.

Flare-up: Any sudden acceleration of fire spread or intensification of a fire. Unlike a blow-up, a flare-up lasts a relatively short time and does not radically change control plans.

Fuel: Combustible material. Includes, vegetation, such as grass, leaves, ground litter, plants, shrubs and trees that feed a fire.

Great Basin Incident Organizer (GBIO): 14 page booklet created by and for fire incident use in Great Basin / Intermountain Region

Helibase: The main location within the general incident area for parking, fueling, maintaining, and loading helicopters. The helibase is usually located at or near the incident base.

Helispot: A temporary landing spot for helicopters.

Helitack: The use of helicopters to transport crews, equipment, and fire retardants or suppressants to the fire line during the initial stages of a fire.

Helitack Crew: A group of firefighters trained in the technical and logistical use of helicopters for fire suppression.

Hotspot: A particular active part of a fire.

Incident: A human-caused or natural occurrence, such as wildland fire, that requires emergency service action to prevent or reduce the loss of life or damage to property or natural resources.

Incident Commander (IC): Individual responsible for the management of all incident operations at the incident site.

Incident Complexity Analysis: A decision making format for analyzing an incident's complexity and determining the type of incident management organization required.

Initial Attack: The actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire.

Interagency: Involving or representing two or more agencies, especially government agencies.

Knock down: To reduce the flame or heat on the more vigorously burning parts of a fire edge.

Lookouts, Communications, Escape Routes, Safety Zones (LCES): A simplified method of mitigating core wildland firefighting safety hazards.

NFS: Lands managed by the USDA Forest Service comprising the National Forest System.

NWCG: National Wildfire Coordinating Group, a group formed under the direction of the Secretaries of Interior and Agriculture to improve the coordination and effectiveness of wildland fire activities.

Personnel Protective Equipment (PPE): All firefighting personnel must be equipped with proper equipment and clothing in order to mitigate the risk of injury from, or exposure to, hazardous conditions encountered while working.

Red Book: Interagency Standards for Fire and Fire Aviation Operations, revised annually. The book contains federal fire program policy, guidance, and standards for the Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, and the USDA Forest Service.

Red Card: Fire qualification card issued to fire rated persons showing their training needs and their qualifications to fill specified fire suppression and support positions in a large fire suppression or incident organization.

Recon: To conduct a reconnaissance of the fire, either from the ground or from the air.

Red Flag Warning: Term used by fire weather forecasters to alert forecast users to an ongoing or imminent critical fire weather pattern.

Resources: Personnel, equipment, services and supplies available, or potentially available, for assignment to incidents.

Retardant: A substance or chemical agent which reduced the flammability of combustibles.

Safety Zone: An area cleared of flammable materials used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe.

Situational Awareness: The ability to identify, process, and comprehend the critical elements of information about what is happening around you with regards to the mission. More simply, *it's knowing what is going on around you.*

Size-up: To evaluate a fire to determine a course of action for fire suppression.

Spot Fire: A fire ignited outside the perimeter of the main fire by flying sparks or embers.

Spot Weather Forecast: A special forecast issued to fit the time, topography, and weather of each specific fire. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts.

Spotting: Behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.

Suppression: All the work of extinguishing or containing a fire, beginning with its discovery.

Tactics: Deploying and directing resources on an incident to accomplish the objectives designated by strategy.

Wildland Fire Situation Analysis (WFSA): A decision-making process that evaluates alternative suppression strategies against selected environmental, social, political, and economic criteria. Provides a record of decisions.